



SUMMARY OF RESEARCH

Final summary of activity conducted under

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*Support for International Space University's (ISU)
2003 Summer Session Program and the Theme Day on
"Living and Working in Space"*

Period of Performance for the Grant: December 1, 2003-November 30, 2004

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Summary of Research

The 2003 Summer Session Program of the International Space University (ISU) was conducted at the ISU Central Campus in Strasbourg, France, July 5-September 6, 2003. Attending the Summer Session were 114 students from 27 countries including the US.

The International Space University (ISU) offers its students a unique and comprehensive educational package covering all disciplines related to space programs and enterprises – space science, space engineering, systems engineering, space policy and law, business and management, and space and society. By providing international graduate students and young space professionals both an intensive interdisciplinary curriculum and also the opportunity to solve complex problems together in an intercultural environment, ISU is preparing the future leaders of the emerging global space community.

Since its founding in 1988, ISU has graduated more than 2200 students from 87 countries. Together with hundreds of ISU faculty and lecturers from around the world, ISU alumni comprise an extremely effective network of space professionals and leaders that actively facilitates individual career growth, professional activities and international space cooperation.

ISU's interdisciplinary Student Theme Days and Student Workshops are intended to have great educational value for the participants. Along with the interdisciplinary Core Lectures, they apprise the students of state-of-the-art activities, programs and policies in space-faring nations. They also provide ISU students the opportunity to meet world experts in space-related subjects.

The ISU Theme Day on "Living and Working in Space" was conducted on July 10, 2003, as a major element of the 2003 Summer Session. The Theme Day provided a concentrated look at medical and psychosocial issues involved in spaceflight. With this background, the students then focused on issues associated with crew selection. The Theme Day presented three academic lectures (The Brain in Space, The Heart in Space, and Psychosocial Issues of Spaceflight) in the morning, followed by a hands-on workshop in the afternoon involving three related activities (demonstration of spaceflight hardware used in Shuttle-based neuroscience experiments, demonstration of cardiovascular research equipment, and exercises modeling crew selection decision processes). The Theme Day culminated with an ISU Distinguished Lecture: a panel presentation by an international group of astronauts who addressed real issues associated with international crews on the International Space Station.

A hand-out that was provided to the students explaining the elements of the Theme Day is attached.

Attachment

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INTERNATIONAL SPACE UNIVERSITY
Summer Session Theme Day: "Living and Working in Space"
July 10, 2003

The Brain in Space
Dr. Giles Clément

This lecture will review the effects of microgravity on the functioning of the sensory organs primarily used for balance and spatial orientation. Disorientation and malaise are frequently encountered during early exposure to microgravity and on return to Earth because the brain misinterprets and does not adequately respond to the signals coming from the sensory receptors. These processes and effects will be described. Theories and actual data regarding the role of the central nervous system in the adaptation of sensory-motor functions (including the control of posture, eye movements, and self-orientation) to changing environmental gravity level will be explored.

The Heart in Space
Dr. Chiaki Mukai

One of the major concerns for both short- and long-term space flight is the phenomenon of cardiovascular deconditioning. This deconditioning is characterized by an intolerance to maintain an upright posture during standing, as well as a decrease in exercise capacity, just after landing. This lecture will introduce the principles of cardiovascular fluid, blood pressure regulation, and electrolyte control to better understand the symptoms typically reported by space travelers. Data from flight experiments are discussed as well as the value of ground-based models such as bed rest studies. The value of exercise, inflatable suits, saline loading, and artificial gravity as countermeasures will also be discussed.

Psycho-Sociological Issues of Spaceflight
Dr. Giles Clément

This lecture will emphasize the importance of mental and social well-being in the success of both short and long space missions. What are the psychological and sociological issues which must be addressed, especially for international missions? We will review the factors that may have a critical impact on the success or failure of a space mission, in terms of interactions of the crewmember with his/her habitat, with the space environment, and with the other crewmembers.

Living and Working in Space Theme Day Workshops

Acquiring a deep understanding of human physiology and behavior in microgravity is critical to human space flight. During this series of workshops, the students will get a hands-on experience with basic measurements and diagnostic tools used to assess the neuro-vestibular and cardiovascular systems, such as eye movements, blood pressure, electrocardiogram, and cardiac echography recordings. They will also become familiar with the difficulties in selecting the most useful crew for a space mission, based on various mission requirements.